



BOOST™

emccd BT1900



The SPOT™ BOOST™ BT 1900 back illuminated EMCCD camera has single photon detection capability without an image intensifier, combined with greater than 90% QE of a back illuminated sensor. Containing a 128x128 L3Vision™ Frame Transfer CCD sensor from E2V Technologies, it utilizes a unique electron multiplying structure that is built into the silicon. This enables charge from each pixel to be multiplied on the sensor before it is read out, while utilizing the full QE performance of the CCD sensor. This camera is capable of greater than 500 full frames/sec, with much faster speeds available through use of sub-array and/or binning. The system offers up to 10 MHz pixel readout rate and benefits from negligible dark current with unequalled thermoelectric cooling down to -100°C .

CAMERA SPECS

- **EMCCD Technology**
- **True Linear gain**
- **> 90% QE back-illuminated sensor**
- **Variable readout rates up to 10 MHz**
- **515 full frames/sec possible**
- **Vacuum sealed cooling**
- **Thermoelectric cooling to -100°C possible**
- **High dynamic range**
- **Built-in C-mount compatible shutter**
- **EM protect**

Ultimate in sensitivity from EMCCD gain – even single photon signals are amplified above the noise floor.

Control EMCCD gain with a linear, quantified scale – ask for a gain value and get it corrected to the CCD temperature.

Maximum possible photon collection efficiency

Quantitative accuracy at all speeds

Ideal for highly dynamic, low light experiments

Critical for sustained vacuum integrity to maintain unequalled cooling and QE performance

Critical for elimination of dark current detection limit – an EMCCD must!

Extended sensor dynamic range (readout speed dependent) and matched digitization for quantization of dim and bright signals

Easy means to record control dark images – excellent for optimization of experimental set-up

EM gain register is protected from accidental damage using built-in algorithms. Also limits long-term gain aging.

CAMERA OVERVIEW

Active Pixels	128 x 128
Pixel Size (WxH; μm)	24 x 24
Image Area (mm)	3.1 x 3.1
Active Area pixel well depth (e-, typical)	200,000
Gain Register pixel well depth (e-, typical)	800,000 ²
Max Readout Rate (MHz)	10
Frame Rate (frames per sec)	515 up to ~5,000
Read Noise (e-)	<1 EM gain < 50 conventional @ 10 MHz

SYSTEM CHARACTERISTICS

Peak QE	> 92%
Pixel Readout Rate (MHz)	10, 5, 3, 1
Electron Multiplying Amplifier	10, 5, 3, 1
Conventional Amplifier	3 and 1
Digitization @ 10, 5, 3 & 1 MHz readout rate	True 14-bit (16-bit available-Special Order Only)
Vertical Clock Speed (μs)	0.0875 to 0.45 (variable)
Linear Electron Multiplier Gain (software controlled)	1 – 1000 times
Non-Linearity	<1%
Triggering	Internal, external, external start
Camera window type	Single window with double-sided AR coating–standard for BV model

DARK CURRENT & DARK CURRENT BACKGROUND EVENTS⁴

@ -85° C (e-/pix/sec) 0.002

EMCCD-Amplified Background Events⁵ (events/pix)
@ 1000 x gain and -85° C

NOISE

System Readout Noise (typical; e-) ⁶	Typical	with Electron Multiplication
10 MHz through EMCCD amplifier	49	<1
5 MHz through EMCCD amplifier	40	<1
3 MHz through EMCCD amplifier	30	<1

OPERATING & STORAGE CONDITIONS

Operating Temperature 0° C to 30° C ambient
Relative Humidity < 70% (non-condensing)
Storage Temperature -25° C to 55° C

COMPUTER REQUIREMENTS

To handle data transfer rates of 10MHz readout over extended sequential (kinetic) series, a powerful computer is recommended, e.g:

- 3 GHz Pentium (or better)
- 1GB RAM
- Minimum of 10,000 rpm hard drive, RAID 0 15,000 rpm preferred for extended sequential images

Power Requirements⁷:

0.6A @ +12V | 0.3A @ -12V | 3.0A @ +5V

Also:

- PCI-compatible computer
- PCI slot must have bus master capability
- Available auxiliary internal power connector
- 32 Mbytes free hard disc space

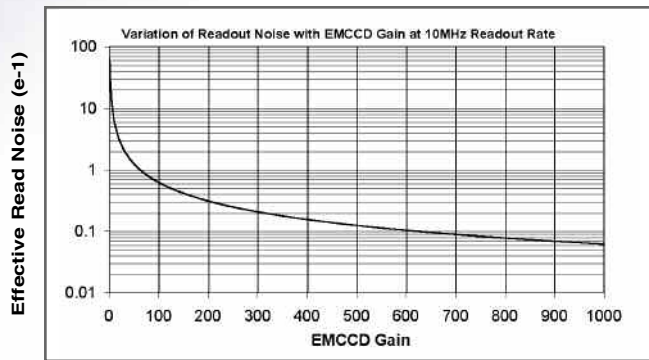
Operating System:

Windows 2000 or XP operating system

Need more information? Contact us at:

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NOISE & EMCCD GAIN



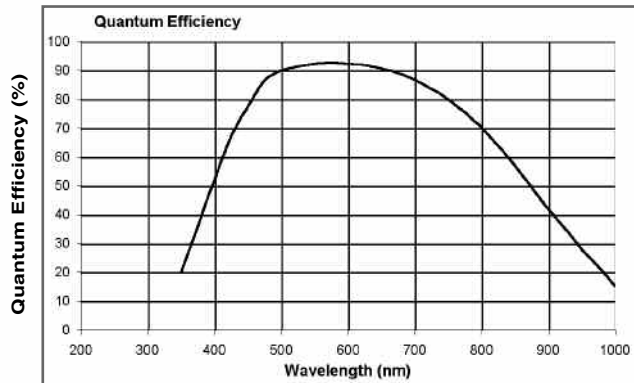
Cooling Temperature

Air-cooled (ambient air @ 20° C) -85° C

Water cooled using Re-circulator (RC180) (ambient air @ 20° C) -90° C

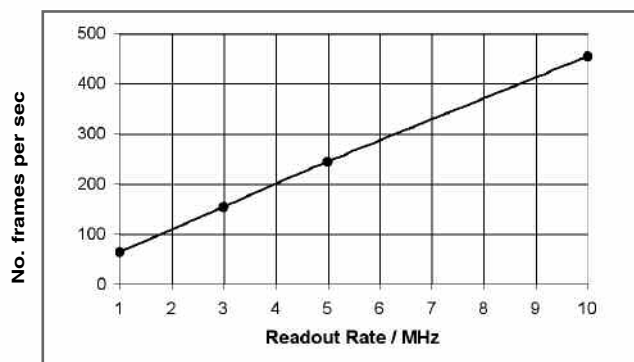
Water-cooled using Chiller (water @ 12° C, 0.75 l / min) -100° C

QUANTUM EFFICIENCY



Quantum Efficiency at 575 nm and -20° C⁸

FULL FRAME RATE⁹



MAX FRAMES PER SEC (0.3 μs vertical clocking)

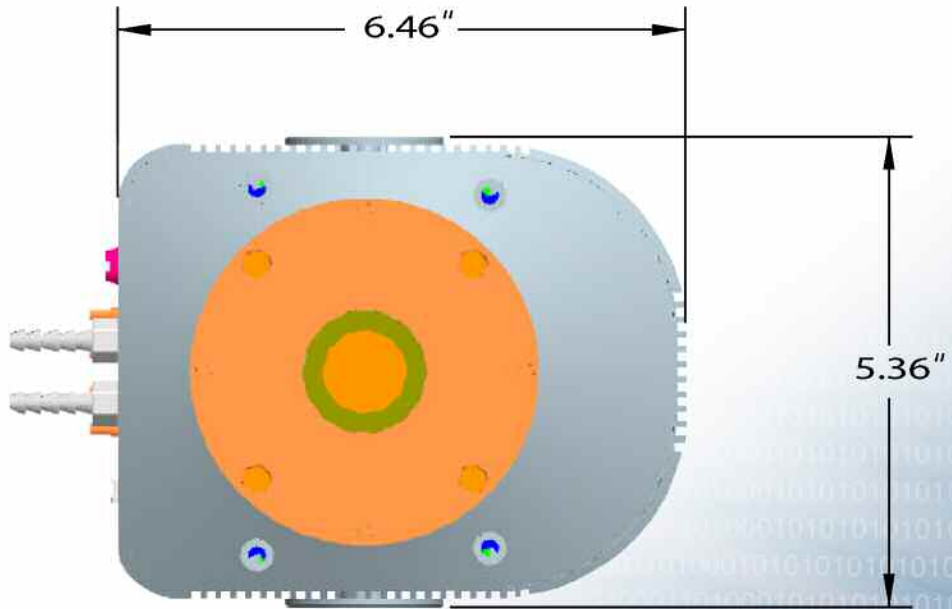
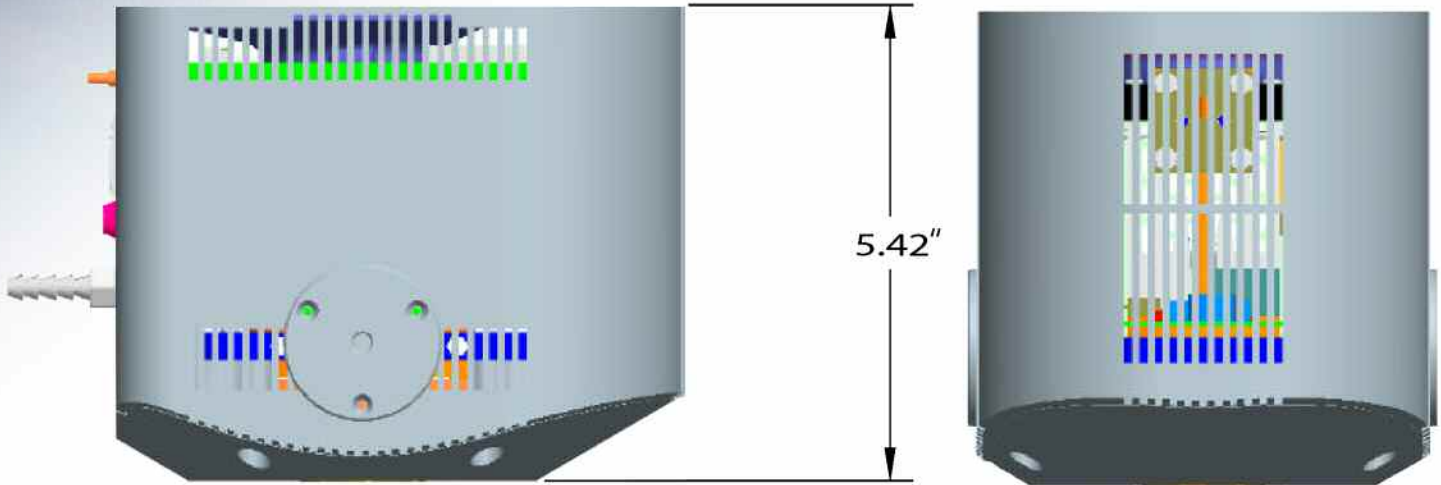
Array size	128 x 128	64 x 64	32 x 32	128 H x 50 V
Binning (full frame)				
1x1	515	943	1613	1163
1x2	943	1613	2500	1923
2x2	943	1613	2500	1923
1x4	1613	2500	3571	2941
4x4	1613	2500	3571	2941

BOOST™ Model:BT 1900
128 x 128 7.27.06



BOOST™

dimensions



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